



46th Annual Gun and Missile Systems Conference

A Virtual Learning Environment for Precision Indirect Fires

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April 13, 2011

Agenda

- The Need for Virtual Environments
- Precision Fires Virtual Environments
 - Phase 1: Virtual Learning Environment
 - Phase 2: Virtual Training Environment
- Summary



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The Evolving Fires Kill-Chain

- Role of indirect fires is evolving to include tasks normally serviced by Joint or direct fire munitions
 - Precision strike, danger-close situations, avoidance of collateral damage
- Indirect fire munitions are becoming more precise and the kill-chain needed to employ them is becoming more complex
 - Target location requirements
 - FO must report an accurate grid
 - FDC must program TLE constraints into AFATDS
 - Employment planning
 - Off-axis planning, fail safe impact zones, collateral damage planning
 - Munition initialization
 - Munition must be properly initialized with grid coordinates and fuze settings
- As Copperhead exemplifies, when the kill-chain becomes complicated, the munition often does not get used due to lack of familiarity
 - Virtual Learning Environments can help the Warfighter better understand and properly employ the new, evolving Fires kill-chain

The precision fires kill-chain is becoming more sophisticated and virtual environments can aid in familiarization and training

The Case for Virtual Environments

- As precision indirect fires munitions become more capable and thus more costly, traditional live fire exercises for training become less cost-effective
- Virtual exercises can provide effective training for a fraction of the cost of live fire exercises
 - Inclusion of accredited in-flight simulations (6-DOF) vital to ensuring accurate representation of munitions
 - Supplements live fire exercises for mission rehearsal
- Virtual already being employed in school-houses for other sophisticated weapon systems, supplemented with occasional live fires
 - Air-to-air missiles, ballistic missile defense, direct fire missiles
- Virtual already being used for parts of the Fires kill-chain
 - VBS2Fires for FO training (Ft. Bragg)
 - VRSG for JTAC training (AFRL-MESA)



Virtual environments can provide effective, inexpensive supplemental training to live fire exercises

Precision Fires VLE: Phase 1

■ Overview

- A virtual environment that represents the entire precision fires kill chain, from Forward Observer to the Firing Unit and munitions
- User makes decisions to progress through a tactical scenario and see the outcomes of their actions
- Collaborative effort between RTN and Fires Center of Excellence to explore technology for virtual learning environments

■ Objective

- Increase the Warfighter's understanding of precision fires
- Model the entire precision-fires kill-chain to an appropriate level of fidelity
- Present the user with decisions that are doctrinally correct
- Model relevant combat scenarios that illustrate when to use precision



The Virtual Learning Environment will reinforce and improve the Warfighter's understanding of precision fires

The Virtual Learning Environment

■ VLE Concept

- User will select a scenario and his role
- VLE will develop the scenario by showing the user animation clips
- At key points, the user will be asked to make a decision on how to respond to events in the scenario
- Scenario will continue to unfold based on the user's decisions
- User will see the outcome of their decision and will be able to go back and explore other options

■ User Roles



Forward Observer

- Conduct a call for fire (CFF)
- Understand when precision munitions should be employed
- Request a precision munition and fuze mode and provide the necessary TLE
- Observe results and request further actions if necessary



Fire Direction Center

- Decide which area or precision munition to use
 - Examine target, collateral damage concerns, and TLE
- Process the CFF through AFATDS and generate Fire Mission



Firing Unit

- Place the guns while taking Excalibur's large maneuver footprint into consideration
- Unpack and inspect the munitions
- Set the fuze (EPIAFS) and load the munition
- Execute the Fire Mission

VLE will expose the user to every role, giving them a complete understanding of the precision fires kill-chain

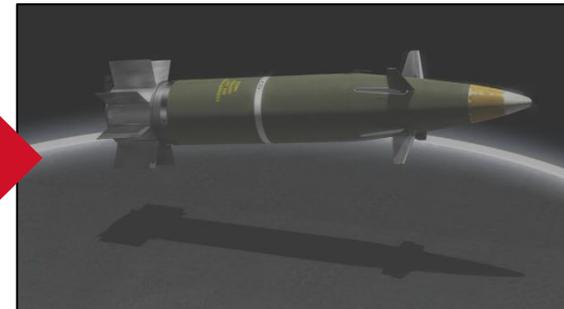
An Example of the VLE (FO User)



Scenario is presented to FO user; *troops pinned down by ambush from nearby structure*



FO is instructed to conduct a CFF and is presented a choice of munitions and the required scenario information



FO selects a precision munition; VLE instructs him to obtain TLE < 10m for the structure target and explains need for a tight TLE



FO observes effects of decisions and must decide if re-engagement with adjustments is necessary

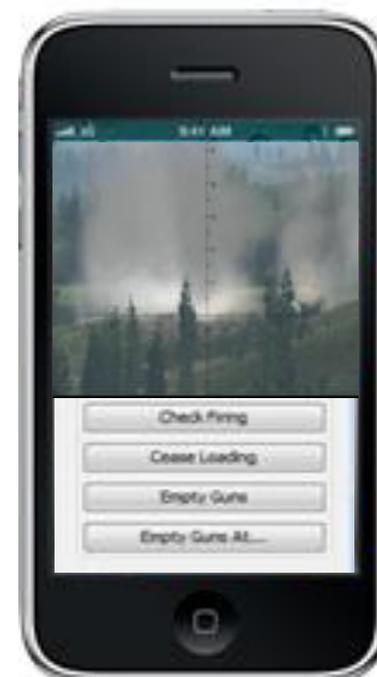


FO sends CFF by selecting appropriate commands to send to FDC, including munition selection and Fuze setting

Scenario presents the user with a relevant mission that enables a better understanding of precision munitions and how to employ them

Deploying the VLE

- VLE will be a light-weight, browser based application that can be deployed on multiple devices
- Possible deployment methods:
 - Web-based deployment on AKO / FKN / DKO
 - DVD deployment for personal computer use and rapid deployment
 - App deployment for use on touch-based devices



Light-weight nature of VLE allows it to be easily and rapidly deployed on multiple devices

Precision Fires VLE: Phase 2

■ Overview

- A full training version of the kill-chain that makes use of virtual and live devices combined with digital IFS / 6DOFs
- Virtual FO devices created in VBS2 (LRAS3, PSS-SOF, etc)
 - Allows for individual soldier training with an accurate representation of their system
 - Could be connected to live training devices for added fidelity
- FDC would use live AFATDS
 - Virtual FO sensors in VBS2 would send live JVMF messages to AFATDS for the FDC to process
 - Live JVMF messages would also be sent to the FU
- Virtual representations of the guns, munitions, and EPIAFS created for FU in VBS2
- Once the round is fired, the 6DOF would accurately fly the munition to the target grid



■ Objective

- Replicate the Fires kill-chain in an L-V-C environment to a level of fidelity that enables realistic and effective training

The virtual training environment will provide the Warfighter with an accurate, virtual representation of the fires kill-chain

The Virtual Training Environment

FO Environment

- Live / Training devices view Virtual world
- Accurate representations of FO devices
 - PSS-SOF, BFIST, FS3, LLDR, etc
- VBS2 and VBS2Fires



VBS2

JVMF



FDC Environment

- Live AFATDS receiving and sending JVMF messages

FU Environment

- Virtual representations of guns and munitions
- VBS2



DIS/HLA



Munitions

- Munitions IFS / 6DOFs fly munition accurately

All participants in the kill-chain would interact with the virtual world using either live or virtual versions of their devices

Summary

- As precision indirect fires munitions become more capable and thus more costly, traditional live fire exercises for training become less cost-effective
- Virtual environments can provide effective, inexpensive supplemental training to live fire exercises
- Phase 1: The Virtual Learning Environment
 - A scenario driven, interactive tool to reinforce and improve the Warfighter's understanding of the entire precision fires kill-chain
- Phase 2: The Virtual Training Environment
 - An accurate representation of the kill-chain that makes use of virtual and live devices combined with digital IFS / 6DOFs



The precision fires virtual learning environment is being collaboratively investigated by the customer and Raytheon

Questions?

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